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COMPUTATIONAL STUDY ON FLOW THROUGH TOROIDAL AEROSPIKE NOZZLE

Abstract

Fully reusable, single-stage-to-orbit (SSTO) has the potential to fulfill space transportation goals in near future. Launch vehicle systems like Virgin Galactic's "SpaceShipTwo", a hybrid-powered, winged Horizontal Take-off Horizontal Landing (HTHL) are changing the face of the space launch industry. The technology of reusable launch vehicles enables the spacecraft to perform orbital spaceflight, land back, and get refurbished for the next spaceflight, which exponentially reduces the cost per flight. However, conventional engines utilize the traditional bell-type nozzles, though, it has a considerable scope of advancement. Comparatively, Altitude Compensation Rocket Nozzle (generally known as the Aerospike nozzle) is capable of maintaining its aerodynamic efficiency and provides the highest performance over a wide range of altitude. The efficiency at low altitudes is much higher because the atmospheric pressure restricts the expansion of exhaust gases. At low altitudes, the vehicles using an aerospike nozzle save 25-30This paper focuses on the analysis of heat transfer issues in aerospike nozzle using computational study. For this study, a toroidal aerospike nozzle is considered and CFD analyses are carried out at variable altitude and possible solutions are proposed for its use in SSTO reusable launch vehicle.